during the initial fill of the line must be made of materials that are suitable for those low temperatures.

§ 195.104 Variations in pressure.

If, within a pipeline system, two or more components are to be connected at a place where one will operate at a higher pressure than another, the system must be designed so that any component operating at the lower pressure will not be overstressed.

§ 195.106 Internal design pressure.

(a) Internal design pressure for the pipe in a pipeline is determined in accordance with the following formula:

$$P = (2\ St/D) \times E \times F$$

P=Internal design pressure in pounds per square inch gauge.
S=Yield strength in pounds per square inch determined in accordance with paragraph (b) of this section.
t=Nominal wall thickness of the pipe in inches. If this is unknown, it is determined in accordance with paragraph (c) of this section.
D=Nominal outside diameter of the pipe in inches.
E=Seam joint factor determined in accordance with paragraph (e) of this section.
F=A design factor of 0.72, except that a design factor of 0.60 is used for pipe, including risers, on a platform located offshore or on a platform in inland navigable waters, and 0.54 is used for pipe that has been subjected to cold expansion to meet the specified minimum yield strength and is subsequently heated, other than by welding or stress relieving as a part of welding, to a temperature higher than 900° F (482° C) for any period of time or over 600° F (316° C) for more than 1 hour.

(b) The yield strength to be used in determining the internal design pressure under paragraph (a) of this section is the specified minimum yield strength. If the specified minimum yield strength is not known, the yield strength to be used in the design formula is one of the following:

(1)(i) The yield strength determined by performing all of the tensile tests of API Specification 5L on randomly selected specimens with the following number of tests:

Pipe size	No. of tests
Less than 168.3 mm (6⅝ in) nominal outside diameter.	One test for each 200 lengths.
168.3 through 323.8 mm (6⅝ through 12¾ in) nominal outside diameter.	One test for each 100 lengths.
Larger than 323.8 mm (12¾ in) nominal outside diameter.	One test for each 50 lengths.

(ii) If the average yield-tensile ratio exceeds 0.85, the yield strength shall be taken as 165,474 kPa (24,000 psi). If the average yield-tensile ratio is 0.85 or less, the yield strength of the pipe is taken as the lower of the following:

(A) Eighty percent of the average yield strength determined by the tensile tests.

(B) The lowest yield strength determined by the tensile tests.

(2) If the pipe is not tensile tested as provided in paragraph (b) of this section, the yield strength shall be taken as 165,474 kPa (24,000 psi).

(c) If the nominal wall thickness to be used in determining internal design pressure under paragraph (a) of this section is not known, it is determined by measuring the thickness of each piece of pipe at quarter points on one end. However, if the pipe is of uniform grade, size, and thickness, only 10 individual lengths or 5 percent of all lengths, whichever is greater, need be measured. The thickness of the lengths that are not measured must be verified by applying a gage set to the minimum thickness found by the measurement. The nominal wall thickness to be used is the next wall thickness found in commercial specifications that is below the average of all the measurements taken. However, the nominal wall thickness may not be more than 1.14 times the smallest measurement taken on pipe that is less than 508 mm (20 in) nominal outside diameter, nor more than 1.11 times the smallest measurement taken on pipe that is 508 mm (20 in) or more in nominal outside diameter.

(d) The minimum wall thickness of the pipe may not be less than 87.5 percent of the value used for nominal wall thickness in determining the internal design pressure under paragraph (a) of this section. In addition, the anticipated external loads and external pressures that are concurrent with internal

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pressure must be considered in accordance with §§ 195.108 and 195.110 and, after determining the internal design pressure, the nominal wall thickness must be increased as necessary to compensate for these concurrent loads and pressures.

(e) The seam joint factor used in paragraph (a) of this section is determined in accordance with the following table:

Specification	Pipe class	Seam joint factor
ASTM A53	Seamless	1.00
	Electric resistance welded	1.00
	Furnace lap welded	0.80
	Furnace butt welded	0.60
ASTM A106 ..	Seamless	1.00
ASTM A 333/ A 333M.	Seamless	1.00
	Welded	1.00
ASTM A381 ..	Double submerged arc welded	1.00
ASTM A671 ..	Electric-fusion-welded	1.00
ASTM A672 ..	Electric-fusion-welded	1.00
ASTM A691 ..	Electric-fusion-welded	1.00
API 5L	Seamless	1.00
	Electric resistance welded	1.00
	Electric flash welded	1.00
	Submerged arc welded	1.00
	Furnace lap welded	0.80
	Furnace butt welded	0.60

The seam joint factor for pipe which is not covered by this paragraph must be approved by the Administrator.

[Amdt. 195–22, 46 FR 38360, July 27, 1981; 47 FR 32721, July 29, 1982, as amended by Amdt. 195–30, 49 FR 7569, Mar. 1, 1984; Amdt 195–37, 51 FR 15335, Apr. 23, 1986; Amdt 195–40, 54 FR 5628, Feb. 6, 1989; 58 FR 14524, Mar. 18, 1993; Amdt. 195–50, 59 FR 17281, Apr. 12, 1994; Amdt. 195–52, 59 FR 33396, 33397, June 28, 1994]

§ 195.108   External pressure.

Any external pressure that will be exerted on the pipe must be provided for in designing a pipeline system.

§ 195.110   External loads.

(a) Anticipated external loads (e.g.), earthquakes, vibration, thermal expansion, and contraction must be provided for in designing a pipeline system. In providing for expansion and flexibility, section 419 of ASME/ANSI B31.4 must be followed.

(b) The pipe and other components must be supported in such a way that the support does not cause excess localized stresses. In designing attachments to pipe, the added stress to the wall of the pipe must be computed and compensated for.

[Amdt. 195–22, 46 FR 38360, July 27, 1981, as amended at 58 FR 14524, Mar. 18, 1993]

§ 195.111   Fracture propagation.

A carbon dioxide pipeline system must be designed to mitigate the effects of fracture propagation.

[Amdt. 195–45, 56 FR 26926, June 12, 1991]

§ 195.112   New pipe.

Any new pipe installed in a pipeline system must comply with the following:

(a) The pipe must be made of steel of the carbon, low alloy-high strength, or alloy type that is able to withstand the internal pressures and external loads and pressures anticipated for the pipeline system.

(b) The pipe must be made in accordance with a written pipe specification that sets forth the chemical requirements for the pipe steel and mechanical tests for the pipe to provide pipe suitable for the use intended.

(c) Each length of pipe with a nominal outside diameter of 114.3 mm (4½ in) or more must be marked on the pipe or pipe coating with the specification to which it was made, the specified minimum yield strength or grade, and the pipe size. The marking must be applied in a manner that does not damage the pipe or pipe coating and must remain visible until the pipe is installed.

[Amdt. 195–22, 46 FR 38360, July 27, 1981, as amended by Amdt. 195–52, 59 FR 33396, June 28, 1994]

§ 195.114   Used pipe.

Any used pipe installed in a pipeline system must comply with § 195.112 (a) and (b) and the following:

(a) The pipe must be of a known specification and the seam joint factor must be determined in accordance with § 195.106(e). If the specified minimum yield strength or the wall thickness is not known, it is determined in accordance with § 195.106 (b) or (c) as appropriate.

(b) There may not be any:

(1) Buckles;

(2) Cracks, grooves, gouges, dents, or other surface defects that exceed the